

Application No.: 10/723942

Docket No.: SIW-074

REMARKS

Applicants amend claims 1-2. No new matter is added. Support for the amendment can be found at page 10, lines 4-5 of the specification. Upon entry of this amendment, claims 1-3 are pending, of which claims 1-2 are independent. Claims 1-3 are rejected under 35 U.S.C. §103(a) as being unpatentable over United States Patent No. 6,458,478 to Wang et al. (hereafter "Wang") in view of United States Patent No. 6,480,767 to Yamaguchi et al. (hereafter "Yamaguchi") and further in view of United States Patent No. 6,521,369 to Mercuri et al. (hereafter "Mercuri"). For the reasons set forth below, Applicants respectfully submit that the pending claims define over the art of record.

The Claimed Invention

Independent claims 1 and 2 both recite the element of an *output control device* which controls an output current of a fuel cell. The output control device (current and voltage controller 12 in Fig. 1) is interposed between the fuel cell and the capacitor. The output control device directly controls the output current extracted from the fuel cell by means of an on/off action. See, page 10, lines 13-18 of the specification. The use of an output control device solves the prior art problem of overcharging the capacitor by the power generation of the fuel cell during regeneration of the propulsion motor. Therefore, the energy efficiency of the fuel cell vehicle during regenerative operation of the fuel propulsion motor can be improved. In order to know how the output control device should control the output current of a fuel cell, the *regenerative electric power* generated by regenerative operation of the propulsion motor must be calculated, which is achieved by the regenerative electric power calculating device.

Claim Rejection Under 35 U.S.C. §103(a)

Claims 1-3 are rejected as obvious over the Wang reference in view of the Yamaguchi reference and the Mercuri reference. Applicants respectfully submit that the Wang reference, the Yamaguchi reference, and the Mercuri reference, either alone or in combination, do not teach or suggest an *output control device* which controls an output current of a fuel cell or a *regenerative electric power calculating device* that can calculate the regenerative electric power generated by regenerative operation of the propulsion motor, as required by both independent claim 1 and 2.

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Additionally, the combination of the Wang reference, the Yamaguchi reference, and the Mercuri reference, do not teach or suggest that when the chargeable power is less than the regenerative electric power and the pressure of the reactant gas at the fuel electrode of the fuel cell is less than a predetermined pressure, the reactant gas supply device stops a supply of the reactant gas to the oxygen electrode, and the output control device restricts the value of the output current of the fuel cell to substantially zero. The cited references also do not teach that when the chargeable power is greater than the regenerative electric power and the pressure of the reactant gas at the fuel electrode is greater than a predetermined pressure, the output control device cancels the restriction on the output current of the fuel cell, as required by independent claim 2.

Arguments regarding the element of an output control device

The Examiner postulates that the Wang's thermoelectric reformer is equivalent to the output *control* device of the claimed invention. However, the Wang reference teaches that some of the electricity 100 produced in fuel cell 50 is used to power the thermoelectric reformer 10. The remainder of the electricity 100 is directed to either the capacitor 101 or the load 110. See Fig. 1 and Col. 4, lines 61-64. Applicants respectfully submit that the thermoelectric reformer 10 does not control an output current of the fuel cell, but rather consumes the output current of the fuel cell. Nowhere does the Wang reference teach or suggest an output control device that receives an output current extracted from the fuel cell and controls the output current of the fuel cell as required by independent claim 1.

The Examiner further postulates that the Yamaguchi reference teaches that the output current is controlled/calculated by a device, as allegedly indicated in Col. 48, lines 35-60. Applicants respectfully submit that this cited section of the Yamaguchi reference does not teach any controllers, but rather teaches a plurality of calculators, none of which even calculate an output current. The calculators taught in the cited passage are limited to a consumed *electric power* calculator, a battery *state* calculator, a physical quantity per effective *power* calculator, a threshold value calculator, and a target *electric power* generation calculator. Applicants respectfully submit nowhere in the Yamaguchi reference is there a teaching or suggestion to control an output current of the fuel cell. Therefore, Applicants respectfully submit that the

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Yamaguchi reference does not teach or suggest an output control device that controls an output current of the fuel cell.

Additionally, Applicants respectfully submit that the Mercuri reference fails to cure the deficiency of the Wang reference and the Yamaguchi reference. The Examiner cited the Mercuri reference to suggest the idea of fuel cell units formed by sandwiching an electrolyte membrane between a fuel electrode and an oxygen electrode. Nonetheless, the Mercuri reference does not teach or suggest an output control device that controls an output current of a fuel cell.

Accordingly, Applicants respectfully submit that the combination of the Wang reference, the Yamaguchi reference, and the Mercuri reference do not teach or suggest an output control device for controlling an output current of the fuel cell. Additionally, Applicants respectfully submit that neither of the references teaches or suggests a regenerative electric power calculating device which calculates the regenerative electric power which can be generated by regenerative operation of the propulsion motor as required by independent claims 1 and 2.

Arguments regarding the element of a regenerative electric power calculating device

Applicants agree with the Examiner that the Wang reference does not teach the limitation of a regenerative electric power calculating device. However, Applicants disagree that the Yamaguchi reference renders the regenerative electric power calculating device obvious. The Examiner suggests that the Yamaguchi reference suggests the teaching of a regenerative electric power calculating device at Col. 5, lines 54-65 or Col. 48, lines 35-60. However, at Col. 5, lines 54-64, the Yamaguchi references teaches a battery state calculator that can calculate the electric power of a battery from the current coming in or out of the battery and the voltage between the terminals of the battery. Nevertheless, the claimed invention requires a regenerative electric power calculating device to calculate the regenerative electric power generated by regenerative operation of the propulsion motor and not the electric power of battery.

Furthermore, at Col. 48, lines 35-60, the Yamaguchi reference teaches several calculators: a consumed *electric power* calculator, a battery *state* calculator, a physical quantity per effective *power* calculator, a threshold value calculator, and a target *electric power* generation calculator; non of which calculate a regenerative electric power of regenerative operation of the propulsion

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motor. The various calculators taught by Yamaguchi reference teach calculation of electric power consumption of the vehicle, calculation of a battery state, calculation of a predetermined physical quantity concerning the electric power generating apparatus per unit amount for the electric power consumption, determination of a threshold value using predetermined calculation to select operating modes of several device, calculation of a target electric power generation amount for electric power generating apparatus from the threshold value and the physical quantity per effective power. Accordingly, none of the calculators calculate a regenerative electric power of regenerative operation of the propulsion motor.

Additionally, Applicants respectfully submit that the Mercuri reference fails to cure the deficiency of the Wang reference and the Yamaguchi reference. The Examiner cited the Mercuri reference to suggest the idea of fuel cell units formed by sandwiching an electrolyte membrane between a fuel electrode and an oxygen electrode. Nonetheless, the Mercuri reference does not teach or suggest a regenerative electric power calculating device that calculates the regenerative electric power that can be generated by regenerative operation of the propulsion motor.

Applicants respectfully submit that the combination of the Wang reference, the Yamaguchi reference, and the Mercuri reference do not teach or suggest a regenerative electric power calculating device which calculates the regenerative electric power which can be generated by regenerative operation of the propulsion motor as required by independent claims 1 and 2.

Arguments regarding the limitation of conditional statements

For paragraph numbers i and j on page 3 and 4 of the Office Action, the Examiner states that the limitation of

(1) in the case where the chargeable power is less than the regenerative electric power and the pressure of the reactant gas at the fuel electrode of the fuel cell is less than a predetermined pressure, the reactant gas supply device stops supply of the reactant gas to the oxygen electrode of the fuel cell, and the output control device restricts the value of the output current of the fuel cell to substantially zero, is conflicting with the limitation of

(2) in the case where the chargeable power is greater than the regenerative electric power and the pressure of the reactant gas at the fuel cell electrode of the fuel cell is greater than a

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predetermined pressure, the output control device cancels the restriction on the output current of the fuel cell, due to the usage of the word "and". Applicants respectfully disagree. Applicants note that two opposite physical conditions do not happen simultaneously, since the claims as recited do not state that two opposite physical conditions happen simultaneously, but rather under each of the two opposite physical conditions, a certain control method should be used.

Furthermore, Applicants disagree with the Examiner that the limitation of (1) is obvious. As stated in the background of the present application, the prior art does not control the output current of the fuel cell and hence overcharging of the capacitor occurs and unnecessary power generation continues. Furthermore, neither the Wang reference nor the Yamaguchi reference teaches or suggests an output control device that controls an output current of the fuel cell.

Additionally, the Examiner asserts on page 4 of the Office Action that the limitation of (1) that a chargeable power is compared to a threshold in the existence of a gas pressure to control a flow of output current is well-known. Applicants respectfully submit that it is not clear that one of ordinary skill in the art would compare a chargeable power to a threshold in the existence of a gas pressure to control a flow of output current because the units for power and pressure are different and hence cannot be compared. Applicants respectfully request that the Examiner provide supporting evidence of this assertion in the form of an affidavit or a printed publication if the Examiner wishes to maintain this rejection. See MPEP 2144.03(C). Furthermore, Applicants respectfully submit that the limitation of (1) does not compare a chargeable power to a threshold in the existence of a gas pressure. Instead, the limitation of (1) compares a chargeable power with a *regenerative electric power*. That is, the Yamaguchi reference does not teach or suggests the condition of the output current according to a relationship of chargeable power and regenerative power because the chargeable power as claimed is power that can be charged to a capacitor and the Yamaguchi reference does not mention a capacitor in its fuel cell system. Additionally, as set forth above, the Yamaguchi reference does not teach or suggest a device that calculates the regenerative power of regenerative operation of a propulsion motor as claimed.

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Conclusion

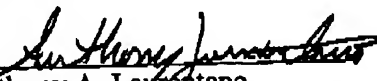
Accordingly, the combination of the Wang reference, the Yamaguchi reference, and the Mercuri reference does not teach or suggest each and every element and limitation of the claimed invention. Applicants respectfully request that the Examiner reconsider and withdraw the rejection of independent claims 1 and 2. Applicants note that dependent claim 3 also recite separate patentable subject matter. As such, for this and the reasons set forth above, dependent claim 3 also define over the art of record.

In view of the above amendment, Applicants believe the pending application is in condition for allowance.

Applicants submit herewith a petition for one-month extension of time. Applicants believe that no other fee is due. However, if other fee is due, please charge our Deposit Account No. 12-0080, under Order No. SIW-074 from which the undersigned is authorized to draw.

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Respectfully submitted,

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